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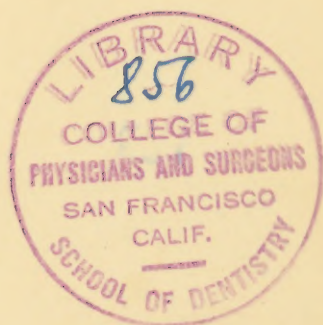
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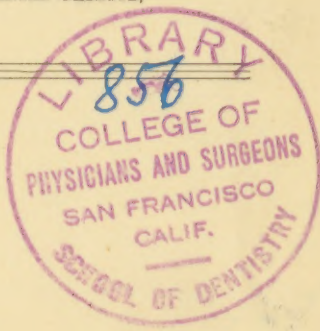
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A REVIEW OF THE PAST
AS ASSOCIATED WITH THE WORK OF
PROF. GREENE V. BLACK.

BY
J. FOSTER FLAGG, D.D.S.
SWARTHMORE, PA.

A paper presented before the
California State Dental Association,
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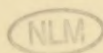
A HISTORY OF THE EAST
AS ASSOCIATED WITH THE WORK OF
JONAS GREENH V. BLAKE

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A REVIEW OF THE PAST AS ASSOCIATED WITH THE WORK OF PROF. GREENE V. BLACK.

BY J. FOSTER FLAGG, D.D.S., SWARTHMORE, PA.

IN the month of May, 1895, there appeared in the *Dental Cosmos* an article from Dr. G. V. Black, which, from its volume, its pretensions, its character and its editorial and other eminent endorsement, was certainly something remarkable.

Its length was nearly seventy pages! Its pretension was that it was the record of the *first scientific inquiry* ever made in its direction. Its character for assumptions, for evidence of *extraordinary* labor in the tabulation of results, but more than all for the "conclusions" reached, was, to say the least, unique; but, if possible, all these considerations were insignificant in comparison with the draft upon adjectives for the effusive, congratulatory, adulative reception which was accorded it by editorial, professorial and eminentorial criticism and endorsement.

Without any discussion, without any general comment, without the giving of any time for even a breath to "the profession," it was hailed from the housetop as the *sum-mum bonum*, the grandum grandorum for which "the profession" had been waiting as the capstone to its already amazing "progress."

This and its associate articles were referred to as of 'wonderful importance' almost before the printer's ink, was dry. In that little gem, the *Miniature Cosmos* for 1896—from which, if from anything, we hope to obtain solidity, truthfulness and sense—we find this paper alluded to in no doubtful tones, but as "likely to serve as a milestone in the future progress of dentistry," as "basal work," as going "to the root of the subject," and, as for its unique

conclusions, that while at direct variance with some of the most strongly intrenched empirical notions of dentistry, "it must be remembered that no statement is made which is not supported by apparently, at least, the most conclusive proofs," thus giving the prestige of a *tendency toward acceptance upon what seemed as reasonable grounds* for at least five of the most palpable absurd "conclusions" that have been offered dentistry during the last half century.

These should be read and repeated, that with each such reading it may be recognized how fully *each day's experience* tells of their fallacy; that with each repetition it may be felt how solidly the "work" of all the workers has established the truth of just *the opposite* of everyone of these "conclusions;" and these truths, which have so universally forced themselves upon the acceptance of *almost* every observing dentist (at least ninety-nine in every hundred), and upon which for the last twenty or thirty years so successful tooth-saving practice has been established, are glibly styled "empirical notions."

And from what has all this smoke ascended and these ashes fallen? From an idea entertained by Dr. Greene Black, that dentists thought that teeth not liable to decay contained an *excess of inorganic* material, and that teeth liable to decay contained an *excess of organic material*.

Upon this *assumption* (for I shall show that it is neither more nor less) an amount of "work" was done that fairly rivals that of those curiously carved Chinese balls of ivory in which each lesser ball turns within each larger; a work which is said to require a lifetime to accomplish, and which when done amounts to nothing.

It was with admiration, as well as pity, for the "investigator" that I gave the time to read those twenty-four pages of analyses and summary which seem to have been so *satisfying*(?) to the "investigator," and which so conclusively proved just what everybody in dentistry had accepted as correct, and what, so far as I know, had never been disputed.

Almost a century ago (1814) Mr. W. H. Pepys Jr. made

the analyses of the enamel, the bone or roots, and of the teeth of adult humans and of the teeth of children. This was done by request of Mr. Joseph Fox, and was published in his book of that date, and his results of analyses are *practically* those given us today by Dr. Black.

To give Dr. Black full credit for *results* to which he certainly is entitled—he has shown that the analyses of “perfect teeth” and of “carious teeth” are almost identical; but what I desire to impress is that he regards this as *proving erroneous the belief* that the relativity of proportions of inorganic and organic constituents in tooth tissue was preventive or permissive of dental caries.

That any such “belief” generally existed I deny. I think that my long and intimate association with dental matters and dental work warrants me in having an opinion regarding this, and I can say that in all my forty years of society and college intimacy I never heard any such doctrine advocated nor even mentioned until I read the third paragraph of Dr. Black’s first article in the *Cosmos* of May, 1895. The whole foundation of the “foolish man who built his house upon the sand” may be found in that paragraph.

From thenceforward he labors through such a mountain of words that I venture to say but very few will ever climb it; but having done so, patiently and perseveringly, I can also say that I found the ascent utterly non-compensating.

It is seventy pages of such as might be given to proving that the earth revolves around the sun, or that it turns upon its own axis, or that just what has been believed and taught *uninterruptedly* as to the relativity of organic and inorganic components of tooth tissues is true, and has never been disputed.

But now comes the *marvel* of all this—the “conclusions” from this enormous amount of useless work. And *such* conclusions from *such* work were fairly gloated over by “an editorial epitome.” “Look at these figures” (!) “Now what do our advocates of ‘plastics for poorly calcified teeth’ and ‘gold only in teeth above the average in structure’ propose to do with these figures” (!)

Just as though "these figures" were entitled to the least attention, except as the most *voluminous corroboration of ordinary textual authority* ever given!

And then this editor goes on to say: "And these conclusions come from a man who has made more real scientific experiments to determine the truth than all the advocates of the 'compatibility' theories have ever performed."

For a "real scientific" opinion I think this beats the record! But he continues: "What is to be done with these demoralizing figures? How are these confoundedly annoying demonstrations to be buried?" "Up to this writing there has been no response. Are we all paralyzed?"

WE!

This editor, at least, seems not to have been "paralyzed"; on the contrary, he seems to have been as thoroughly galvanized as were ever dead frog legs before.

The "figures" have demoralized no one that I know of. It is not *desirable* that these "demonstrations" should be buried. It is better, we think, that they should be kept above ground and left to putrefy, as they seem to be doing, except in the cool air of the "Northwest" (not so far north, and by no means very far west!)

And this is about the caliber of the comments and reviews of *this part* of this extraordinary paper; the paper that "is evidence that the spirit of scientific inquiry is wideawake"! (Miniature *Cosmos* for 1896, page 9, "Pointers for 1896.")

What is the continuous pointer in all this?

"There is practically no difference in the percentage of lime salts between the cases in which the teeth are classed 'of pure structure,' 'lacking in hardness,' and those which dentists usually call 'dense,' perfectly calcified teeth."

Who ever said or thought there was? What chair of dental physiology ever taught more than one analysis showing the percentage of lime salts in dentine? or more than one analysis of the lesser percentage again in cementum? And what chair of pathology ever taught that any *variation from these accepted relativities* was the cause for that

resistance to caries which we find in "hard teeth" (as hard as flint!) or for that liability to decay which some few of us *think* we have noticed in "soft teeth" (soft as chalk), or for the success with which we combat the progress of decay in teeth "above medium in structure"?

Above medium *in structure*! Here "we" have the keynote of the bugle blast which has led *us* to victory!

No such "work" as that of Dr. Greene Black has been done in the fight for this. It has been accepted and taught that the "goodness" or "badness" of teeth depended upon their *makeup*, and not upon what they were made of.

Who would dare teach that if a loaf of bread were made of so much flour, so much milk or water, so much yeast and so much salt, that, with an oven and fire a grand result would be obtained? These are the ingredients and the accessories; but behind all these is *vitality*—that which manipulates and manages; and this *governing attribute* is not the same in any two of a dozen cooks.

And so it has always been taught me, and so I have always taught, that it is with every tissue and organ in the body. The food given may be the same, the selection from it the same, the quantity and quality may be the same, and the *tissues* and *organs* which each economy will make up from these will be the same; but *the makeup* will not be the same, as *each distinctive class of humanity will work under the domination of its peculiar temperamental attributes*.

Thus it is, "bilious" teeth have *strength*; are yellow in color; are set firmly in the jaws; are wonderfully exempt from decay; and in which even ordinary or poor work, with gold as filling material, will last for years, and where such fillings of gold as *any of us* will make would last a lifetime.

Thus it is that "sanguine" teeth are creamy in color; set also with firmness in the jaws; are also reasonably exempt from decay, but in connection with which only *good work* will produce creditable results, and this in every phase of operative dentistry.

Thus it is that in "nervous" teeth even the shape is markedly modified, having the necks small and Gothic-arched, in place of Roman; with edges thin and delicate, and cusps long and sharp, with pearly-bluish color—not so strongly set, and while usually with fine and reasonably strong enamel quite as usual with *not well-calcified dentine*.

Here then begins most decidedly the need for something more regarding "choice of filling materials" than (as Dr. Black puts it) "the individual operator's judgment as to which he can so manipulate as *to make the most perfect filling*, considering the circumstances, his own skill and the durability of the material." (*Cosmos*, May, 1895, page 416.)

And yet the italicized *most perfect filling* unwittingly tells the truth, the whole truth, and nothing but the truth; for, as we would put it, "the most perfect filling" is that one which most perfectly *saves the tooth!*

Is that the standard Dr. Black intends? Do you think so?

And, finally, thus it is that the lymphatic teeth are those which with their enormous size, their suspicious opacity, their loose setting in the jaw, and their ready and persistent yielding to what is known as the "ravages" of decay, give us that class which demand, *as clinically demonstrated*, a far different knowledge from that of the *judgment* of the operator as to his manipulative ability, and no less than an extended knowledge as to the attributes of the materials he proposes to utilize for their tooth-saving ability.

This is what the advocates of "plastics for poorly calcified teeth" have to say. And I feel that they can safely leave the record of their feeble teachings and their meager, unscientific experimentation as a solid defiance to all those "conclusions" which are "at direct variance with those strongly intrenched empirical 'notions'" that are so much **more** strongly intrenched by the daily experience of *almost* every practitioner of dentistry.

A REVIEW OF THE WORK
OF
PROF. GREENE V. BLACK, M.D., D.D.S., Sc.D.

BY
J. FOSTER FLAGG, D.D.S.,
SWARTHMORE, PA.

PART SECOND.

SAN FRANCISCO:
REPRINTED FROM THE PACIFIC MEDICO-DENTAL GAZETTE,
OCTOBER, 1898.

A REVIEW OF THE WORK OF
PROF. GREENE V. BLACK, M.D., D D.S., Sc.D.

BY J. FOSTER FLAGG, D.D.S., SWARTHMORE, PA.

[PART SECOND.]

THE *second* paper of Dr. Black's series appeared in the June *Dental Cosmos* of 1895, and is devoted to the consideration of "The Force Exerted in the Closure of the Jaws."

Although the records of the ingenious instruments used, called respectively the gnatho-dynamometer and the phago-dynamometer, possess a certain degree of interest, and recall to those of us who remember them the experiments made in a similar line by Dr. John D. White some forty years ago, and especially his 250 pounds for the crushing of the shot, and, although Dr. Black tells us that the gnatho-dynamometer has "become a practical instrument" at his chair, it has yet seemed to me that so little has its employment been indulged in generally by members of "the profession," and so usual is it that our patients are perfectly able to masticate such food as they indulge in, and so comparatively easy is it to enable them to do so when, from any reason, a comfortable and sufficient mastication is interfered with, that any further discussion of that portion of his contributions is needless.

I shall, therefore, pass to the consideration of his *third* paper published in the *Cosmos* for July, 1895, under the caption of "Filling Materials," in which, after a pretty engineering prelude in reference to a railway bridge over a

stream of some considerable magnitude, an entire page is preface for the conclusion that "gold and amalgam are the only two filling materials in general use that are *supposed* (the italics are mine) to be able to endure "the stress of long-continued mastication."

I cannot but suggest that as these two materials have not only been accepted as occupying this place among filling materials, but have been subjected to clinical usage in this regard for considerably more than half a century, and having *thus been proven* to be the only materials worthy to be recognized as possessing this attribute, it seems hardly worth while to have devoted so much space to the establishment of an entirely undisputed point.

But from this point onward the planks of this "wonderful" engineering effort seems to me to increase in worthlessness until it appears to be little less than folly to give them the least attention, but so extended has been *favorable* comment upon this "work," and so unanimous has been the evident acceptance of its "solidity" that I have felt that, for the possible good of "the profession," one voice, at least, should be heard in absolute condemnation of it all, from the beginning to the end.

First. I deny that experimental work upon filling materials bears any such relation to railway bridges or buildings as to require, or even desire, that such construction should enter at all into any consideration. Indeed, it would be difficult to find any two results which are made under auspices less consonant, or which are to subserve purposes more completely unlike, or which are to endure under conditions more entirely at variance; I should therefore regard it as perfectly reasonable to expect that so-called "work" thus commenced could not but eventuate in a termination completely valueless.

Second. In amalgam research the experiments of Prof. Hitchcock, done twenty-five years ago, serve as unquestionable proofs that "the hearty support of manufacturers of dental goods" is at least a doubtful basis upon which to erect a superstructure, and yet this "investigator" offers

thanks for this, and acknowledges the receipt of samples of "about eighty different alloys."

A number of formulæ were given, thus enabling the investigation to be conducted on purely scientific lines!

And this is the "science" which has been so gratefully accepted and so effusively applauded.

But as these formulæ were "trade secrets" they had to be "respected," and thus the gentleman starts out not only handicapped by this, but even more so by the conviction, which he expresses, that not only he but "the whole dental profession are under obligations to those of the trade who have so generously supported this effort." What comment can be made upon such belief as this? Had the "effort" of the "New-Departure Corps" been founded upon such generosity I cannot think that the "whole dental profession" would have been benefited in any large degree; while, as it is, I think I can safely assert that every item of truly reliable information possessed by dentistry *to-day* regarding, not only amalgam, but every plastic filling-material which it uses, except porcelain, was given it from the work of the "New-Departure Corps."

Feeling that I am thoroughly conversant with all the work which has been done, and with all the materials which have been offered in connection with plastic work, I make this statement without fear of contradiction, and as a deserved tribute to an earnest, long-continued and satisfactory line of work, together with the unstinted liberality with which results were given by the members of that organization.

That work, so far as amalgam is concerned, was done from the *solid* basis of carefully *purchased* samples of alloys *as offered for sale*, together with such accurate analyses of these as would be made by mint metallurgists.

How very different from this is the published basis of the "investigations" which are under consideration. Samples by the score are generously given by their makers, and formulæ for these accompany the liberal donations. These are gratefully accepted. The recipient, together with the

whole dental profession, is acknowledged as *under obligation*, and the "investigation" proceeds.

For myself I recognize *no obligation*; on the contrary, I think any careful, properly qualified experimenter would naturally regard such aid as of very doubtful value and as likely to lead in the direction of incorrect conclusions.

And now, at once, an attribute of amalgam is noted which seems to have so impressed the gentleman as to have completely filled, for the time, the investigatorial heavens. This attribute was called the "flow." It was shown that *under stress* a mass of amalgam would gradually develop a molecular yielding or creeping out from under the load.

So much "stress" has been laid upon the *value* of this discovery that it seems important that decided notice should be given it that its worth or its worthlessness should be a settled question.

1st. Amalgam has been used "by the ton" for filling teeth, and for more than fifty years, and of so little moment has this attribute proven to be that *it never has been noticed*.

2nd. It is requisite that direct, circumscribed and rather decidedly continuous pressure be borne upon the material in order that indications of this "flow" shall be apparent.

3rd. It is safe to say that not one filling in twenty is so placed as that any such "stress" can be brought to bear upon it, even during the incidental efforts of mastication, much less for any continuous pressure.

4th. Again, the large majority of such fillings as will permit even this occasional impact are retained within cavity walls of such strength as that this "spreading" of the amalgam would be insufficient to do any harm; while, if such "flow" occurred, it *might possibly* be beneficial by forcing a closer contact between fillings and walls; but no such result has ever been noticed.

5th. While the experiments in connection with "flow"—albeit conducted under conditions which would never exist in the mouth—seem to demonstrate that such amalgams as

were "accepted" from the results of New-Departure Corps work had the minimum of this peculiar attribute, it was by no means proven that the amalgam possessed a detrimental degree of it when made from that formula which gave the greatest "flow" (40.16) made from silver 48, tin 48, gold 4—a formula which I think no one would ever use.

6th. In this paper (*Cosmos*, July, 1895,) on pages 559 to 567 (nine pages!) there seems to me to be such a mass of words enveloping such peculiar statements as would render necessary nine pages of review for appropriate notice, but I think a single page may contain sufficient comment to render the other eight pages superfluous.

First. Experiments were begun with an alloy of silver, 47.06, tin, 51.76, copper, 94, zinc, 24,—an alloy which I believe—as the result of hundreds of melts made by experts—could not be duplicated in less than fifty trials, and then only *by luck* rather than by skill!

Second. I hold that the objects for which the several metals are used in compounding amalgam alloys for filling teeth have been so definitely settled during more than twenty years of careful experimentation and patient clinical observation as that it may be regarded as *determined* that the two metals copper and zinc would *never* enter into the composition of any one alloy; therefore, I should consider any experimentation with such amalgam as valueless.

Third. On pages 560–561 a looseness of methods from packing with "broad, serrated point" to "squeezing the mass in a vise"—methods which *have been demonstrated* at lecture-stands to classes, and to bystanders at clinics, for many years, as beneath criticism—is conjoined to an equally scientific looseness of comment regarding the decided preference of hand-mixes over mortar-mixes (after fifty years of cleanly, acceptable using of mortars, to say nothing of other demonstrable advantages); also, regarding the "wringing out by rolling the mass in muslin" and "then discarding the ends of the mass" (not mentioning how much, or why!) in all of which, everything is so at variance with the ideas of all workers of amalgam *except those who never can*

make fillings which they feel are perfect, and whose amalgam work is "so unsatisfactory," that such comments as I have heard or read have been only derisive, which opinions entirely coincide with my own.

It is with much satisfaction that I know of several hundreds of amalgam workers, who do not manipulate at all as does Dr. Black, and who write me, as year after year passes, of the *great satisfaction* they have in the "comfortable saving of the frail, soft teeth of poor structure, with properly compounded and properly introduced fillings of amalgam."

Fourth. Pages 566 and 567 persist in work on the silver-tin alloys, but with no recognition of the *fact* that all this is ploughing old, wornout land, giving us only the inference that those who continue to use amalgams in connection with which we find the most "crevicing" *will have the most!* But in this connection the "*black ditch*" seems so to worry the investigator as that to him it appears as a "monster"!

Now, what is this "monster"? It is a result which accrues, with a certain degree of frequency, after fillings have been in service for periods of from two or three to eight or ten years. The remedy for this is to fissure-drill around the edge of the filling and "cold-solder" a little freshly made amalgam to the filling, an operation by means of which the defect of from two to ten years is repaired in from two to ten minutes! Truly, if the "monster" which Hercules was sent to destroy had been such an one, a six-year-old boy would have been "equal to the emergency."

7th. It would seem, from these various considerations, that in the great "stress" which has been devoted to this "flow" a very large mountain has been made out of a very small molehill, and that, practically, it might be permitted to remain, *as it always has been*, an entirely unimportant factor in the question of amalgam work.

"Flow gently, sweet Afton"; amalgam "flow" on!
Till the fillings and teeth and the patients have gone,
To that "traveler's bourne" whence they'll never return,
As hundreds of thousands in comfort have done;
Flow gently, amalgam; "flow" on!—"flow" on!"

REVIEW OF THE WORK OF PROF. GREENE V. BLACK, M.D., D.D.S., Sc.D.

BY J. FOSTER FLAGG, D.D.S., SWARTHMORE, PA.

[PART THIRD.]

IN my Part Second of this review I referred at short length to the matter contained in pages 559 to 567 of *Cosmos*, July, 1895 ; but "scientific" (?) as this may be, it would seem that science is out-scienced as we peruse pages 567 to 571.

It is noted that the quarter of one per cent. of zinc makes *decided* increase in "flow," and it is argued from this that "the results of this experimental work" are "something of a monument to the integrity, skill and strict fidelity of the men who compounded the alloys."

The "makers of alloys for amalgam" said that "they used pure metals," and "here is unexpected evidence that they have done so."

If *this* is scientific logic, it seems to me conclusive evidence that this branch of logic would bear revising.

What has "one-fourth of one per cent. of zinc" or "three per cent. of platinum" to do with the purity of the silver or the copper or the gold as components of amalgam alloy? and did the "say-so" (if they said so) of the makers of alloys cause the tin to be "pure"?

In the parlance of the day it seems to me that all this integrity-monument business is pure "taffy," based upon a most unsubstantial foundation.

That all the metals used in making amalgam alloys, or that have been used for fifty years have been "pure"—as this term is accepted metallurgically—I think will not be disputed, as, when silver is required for amalgam alloy making, "bar silver" is either rolled or granulated; if gold is required, "fine gold" in plate or ribbon is used, as a rule; and if gold "scraps" are used the metals admixed are either silver or copper, and these are "pure."

The copper used is either wire, sheet, granulated or bar, "pure" (as found commercially), and there is no incentive to have it otherwise.

The tin is the most impure of all the metals used, but it

is such as is used as "tin" in all work except that strictly "chemical."

I think all this is well known and recognized as *usual*; and while it does not detract from the "integrity, strict fidelity," etc., of the makers of alloys (each one of whom makes "the best"!) it does not seem requisite that this state of things should be any further assured by such "unexpected evidence" as that presented by Dr. Black.

The "note of warning" given by the investigator "against jumping" is timely, and, judging from existent conditions, seems to have been universally heeded!

On page 569, after a very unsatisfactory attempt to account for "bulging" of amalgam from cavities in positions where no "stress" can possibly be brought, a little touch in support of the *chemical combine* is given with its ubiquitous little * (asterisk).

If the union of metals in the forming of amalgams is *chemical* the results are certainly worthy of special notice to "scientists," for it is the only known instance in which the components of the "chemical compound" in any and all proportions of any and all of each are made into results which are, each of its class, *practically the same*.

Truly, it reminds one of the combinations of nitrogen and oxygen, which, united chemically in any proportions, produce so nearly the same results as, *like amalgam*, to subserve but one given purpose!

The next point discussed is the "spheroiding of amalgam, so-called," and in no portion of the whole series of papers does the absolute incompetency of the gentleman for the work he has undertaken more palpably appear, while the conclusion to which he arrives (see page 571) is so absolutely impossible of utilization as to render it simply farcical to antagonize it.

He says "the phenomenon from which this term *spheroiding* has been mostly derived seems to be the disposition of amalgam fillings to rise up in the center in rounded form, but partly from the difficulty experienced in making amalgam fillings with perfect margins."

If the disposition of *anything* to "rise up in the center in rounded form" is not *spheroiding*, I would ask, what is it?

And it is this tendency—and *this alone*—which has been noticed by plastic workers, and which, after being carefully watched—not for a few days or months, as we are told was the “work” of the “investigator,” but for years—until after consecutive notings of fillings of soft alloys, notably “Walker’s” (70 tin, 30 silver), the gradual “tendency to rise up in rounded form” of fillings was recognized not only in buccal cavities but in articulating cavities where the long-continued force of mastication was powerless to prevent it.

It was to account for *this* that the tendency to spheroid was accredited to the *slow molecular influence* of the mercury, with its incontestable spheroidal attribute.

And now Dr. Black has a “notion” that “this term has been derived from a misinterpretation of the phenomena seen,” because he, having made blocks of amalgam with square corners of a mass that would fairly *stand alone*, did not note spheroiding.

Had there been a rounding of the corners in such an experiment I would have inclined to attribute it to *gravitation* rather than to *tendency to spheroid*; and as it was, I should merely think that the silver and tin were able to maintain integrity of contour, while the molecular tendency to spheroid was not affected by the experiment.

I should regard all the work described on page 570 as proving no more in this matter than would the *greater weight* of a gold filling introduced into cavities in ivory prove it to be the *better* filling for the saving of the tooth.

But it is in the last paragraph of this July paper (page 571) that we find the conclusion to which I have alluded as “absolutely impossible of utilization.”

Dr. Black says “a large proportion of the amalgam fillings made are placed in cavities so prepared that the surface on which the filling rests, *the seat of the filling*, is too small to support the stress which comes on the area of surface exposed to the stress of mastication; or the seats are so rounded that the readily yielding material allows the mass to be slowly tilted from side to side, or slightly moved. In either case the perfect margin is lost, and the filling becomes leaky.”

In reply to this I would say that in “a large proportion” of

such cavities as are filled with amalgam, either primarily or as final resort, after one or more gold fillings have failed, the preparations of the cavities have to be made *as best one can*, rather than *as one would*, and that, in such cases as have to permit this stress upon their surfaces, the marvel is the great amount of service they give, and the length of time through which they endure.

I venture this as the experience of decidedly the *many* as against that of decidedly the *few*.

Again, Dr. Black says: "Most dentists seemed to have supposed that amalgam fillings were the easiest fillings to anchor safely, but as a fact they are the most difficult." Is that "science"? Is that sense?

I think I have introduced a sufficient number of gold fillings which now, after thirty—and some forty—years of service, demonstrate how they were anchored, and I think it will be conceded that I have introduced vastly many more amalgam fillings than did ever Dr. Black, and I can but say that *if* amalgam fillings are *the most difficult* to anchor, the results of the last thirty years are a "monument" to the skill of the amalgam workers, for is is simply amazing, *under the circumstances*, how well many of the most dreadfully doubtful among these fillings hold to their anchorage!

And, finally he says: "Cavities prepared to receive amalgam fillings should have a broad, flat seat at right angles with the direction of stress, and parallel side walls. The form of a box is the typical form for a cavity for amalgam."

Again I ask is that "science"? Is that sense?

Is it not enough to ask how the form of a box can ever be given to such cavities as should usually be filled with amalgam?

Such cavities not infrequently impinge upon the mesial, buccal, distal and occlusal faces of a tooth, and I would ask, what kind of a "box" could such a cavity be shaped like?

But that is not all—not *by any means*; "a box," such as Dr. Black *must* mean, when no more definite shape is given, would have four sides, straight and flat, parallel in pairs, with a flat, square bottom and with eight corners; in short, it would be a rectangular parallelopiped, and I would ask if it would be *possible*, not to say desirable, that such should be made of any cavity of decay.

REVIEW OF THE WORK OF
PROF. GREENE V. BLACK, M.D., D.D.S., Sc.D.

BY J. FOSTER FLAGG, D.D.S., SWARTHMORE, PA.

[PART FOURTH.]

IN the *Dental Cosmos*, August, 1895, we have a paper on the "Contraction and Expansion of Silver-Tin Amalgams," though why it should be called *that* is not quite apparent, as, against five (5) such amalgams tested, there were fifteen (15) testings of amalgams composed of from four to six metals in place of the three metal "Silver-Tin" amalgams.

The paper states that the subject of amalgam contraction and expansion has been brought prominently before the dental profession "from time to time;" that the general statement has been that "some amalgams contract in setting, while some other amalgams expand."

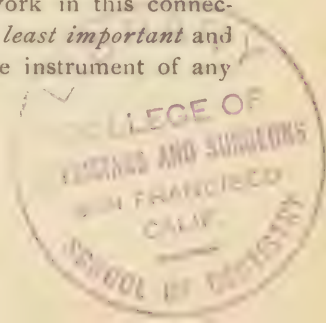
Dr. Black then refers to me, personally, and to my work in this connection, with the comment that after reading me carefully, it seemed to him that though I speak of *making measurements* and *illustrated instruments for this purpose* my conclusions are derived *mostly from theoretic considerations*!

Evidently he has no higher opinion of my work than I have of his; but it should be remembered that my work (as a part of the work of the "New Departure Corps") was done under the auspices of, and by consultation with, six other gentlemen, each of whom had a world wide reputation in his specialty.

Surely if there is any value in combined effort, we seven should weigh favorably as against Dr. Black even in the element of "science."

But next he states that "Drs. Hitchcock and Bogue have done important work in the measurement of the contraction and expansion of amalgams."

Note the word *important*, for of all the work in this connection, of which I am cognizant, this was the *least important* and was done by the poorest and most inadequate instrument of any ever used.



But even this was unknown to Dr. Black, for he comments on this instrument by the assertion that "the amalgam to be measured was pressed upon by a spring which, even though very delicately adjusted, would tend to produce the apparent contraction measured."

Here is another instance of the looseness of assertion and the "jumping to conclusions" which are so frequently illustrative of the "purely scientific" character of the work of Dr. Black, for, the spring in the "index micrometer" of Drs. Hitchcock and Bogue *did not press upon the amalgam* but was delicately adjusted to so press *upon the index needle* as to *move it* when by "shrinkage" a space would otherwise have existed between the disk at its lower end and the amalgam against which this rested.

This pressure was so practically *nothing* as not to be noticed in "expansion" experiments, and when such erroneous criticism is made, it seems to me, to be ignorantly finniky rather than "scientific."

But while the "New Departure Corps" work was done in part, and very much better done, with an "index micrometer" made, with decided improvement over the Hitchcock and Bogue instrument, by that excellent mechanician, Mr. Henry Coy (the "H. C." formerly in the employ of S. S. W.) it was nevertheless duplicated, *by actual micrometric measurement*, by means of apparatus which, while neither so complicated nor, possibly, nearly so expensive as that used by Dr. Black yet measured both "contraction" and "expansion" by the 1000th of an inch and this in lengths of two inches in place of three eighths of an inch, and by secured ingots, thus compelling all change of bulk to exist at only one end, and, finally, thus making the results *at least ten times* as apparent as were the experiments of Dr. Black.

And conclusions from this work, according to Dr. Black, were "derived mostly from theoretic considerations!"

This work, and all the other work referred to by Dr. Black was done from twenty to thirty years ago, and *one grand conclusion* was reached—viz—that those amalgams which "contracted" the most had not seriously detrimental contraction, and those amalgams which "expanded" the most, (even pure silver amalgam) had not seriously detrimental "expansion," while, for those amalgams which had finally been "accepted," and for which formulæ were given in my book on "Plastics," so little of either contraction or expansion existed as that *further work on*

those points was regarded as unnecessary, which conclusion, so far as I know, was adhered to until this work of Dr. Black's was inaugurated.

And what is the result of all this further work—a review of his tabulated results will show that notwithstanding the most peculiar methods of manipulation and introduction of amalgam masses (to which I shall refer in place) the few reasonable formulae—practically such as have been largely used for twenty years—give, almost universally, “margins perfect,” while when this is not so it is under such manipulation as, I think, no decently educated amalgam worker would indulge in.

But this is not all that should be said of this “magnificent” “astounding” “scientific” experimentation, for, what purpose, other than the mere passing of time, could possibly be assigned for work done with such formulae as—

Silver	41.92	Silver	42.83
Tin	56.33	Tin	51.62
Platinum	.44	or Copper	4 65
Zinc	.88	Aluminum	.55
Bismuth	.44	Gold	.01 !!

Could any combinations of metals for the purpose of making dental amalgam alloys be more absurd? One cannot but be reminded of the so-called “shot-gun” prescriptions of general medicine, examples which I am able to say are not necessarily followed in the practice of *dentistry*.

As we pass on in the perusal of this August paper there are so many pages of seemingly innocent comments that it is really not worth while to comment on them, as for example, “I admire the skill displayed in the magnificent velvety fineness of the cut of many of our modern alloys”! Perhaps if the scientist had investigated as to how it was done, much of the “velvety magnificence” might have vanished; while again, in commenting on the relative increase of “expansion” with heavily silver alloys and their needed increase of mercury as a solvent for the silver, he says “the disposition to expand becomes notable in connection with this increase in the amount of mercury required.”

Of this *I should say* that the disposition to expand, becomes notable in connection with this increase in the amount of silver in the alloy—for—we recognize that pure silver amalgam is that which expands the most notably of all accepted dental amalgams.

The remaining seven pages of this portion of Dr. Black's work I find full of peculiar ideas as to the importance of what I should

regard as absolutely unimportant—viz—the effects of undesirable and unused quantities of mercury; the special cuttings of the alloys—just as though the special character of the alloy did not, in large degree, *compel* its appropriate cutting—together with the constant reference to the lesser amount, relatively, of mercury in “hand makes” as contrasted with “mortar makes,” without any apparent knowledge as to *why* this is so, or, any notice of the many decided advantages of the method of “mortar making” over “hand making” as *per contra* to the very questionable disadvantage of *possibly increased shrinkage*—which, *if an objection* could most readily be overcome by formulæ long since known and demonstrated in the enormous “inch and a half” tube fillings of class illustration; and further by the frequent allusion to the “muslin wringing” (at this late date of amalgam work!) and finally by mention, with approbation, and, wonderful to relate, *as though it were something new!* of the removal of softened material and the adding of more material “until the cavity is more than full, and then finish down,” a manipulation which has been recognized as most desirable and *has been taught* for more than twenty five years!

All this together with the remarkable (to use the mildest possible term) length of time consumed in the introducing of these “amalgam test fillings” seems to preclude any other criticism than an expression of pity and wonder that such matter could have been offered, accepted and *extolled*.

Not only was from *nearly* to *over an hour* consumed in the packing of *each* of these “tests,” but one was noted as “quickly and lightly” with 25 minutes given as the time!

What *can* be said of such “work” as this?—Only, that it *prepares us for* such material as was not only contributed to, but published and endorsed as “evidence” that the Dental Cosmos was “alert to bear the tidings of its discoveries to the dental profession;” and it bore them to it semi-periodically! until the glorious revelations culminated in that tidal wave of scientific scintillation which I shall note as making memorable in dental literature the month of December, 1896.

REVIEW OF THE WORK OF PROF. GREENE V. BLACK, M.D., D.D.S., Sc.D.

BY J. FOSTER FLAGG, D.D.S, SWARTHMORE, PA.

[PART FIFTH.]

In the *Cosmos*, Sept. 1895, we have a continuation of the contributions by Dr. Greene V. Black which commences in a manner so "short, sharp and decisive" as to fairly make one laugh—

"COPPER AMALGAM."

"Copper amalgam seems to have failed in the clinical trial that has been made of it in filling teeth."

On reading this I wondered what those who had *used* "copper amalgam" for from thirty to almost fifty years, and had seen hundreds, aye, thousands of fillings, some of which had been doing service ever since Dr. Black was a little boy, made from the good old-fashioned "Sullivan's Amalgam" would think of this portion of this "astounding" work!—

My conclusion was that they would agree to the propriety of *this* adjective, even though they might possibly disagree with the others of the remarkable list which have been so lavishly utilized.

If Dr. Black had stated that the "chemically pure" "scientifically compounded" "made by a new process" "hydraulically compressed" "electrolytically precipitated" copper amalgams, which though pronounced "best" by numbers of practitioners who had never used any kind of "copper amalgams" before, had yet *disappointed their expectations*! his assertion might have shown some knowledge of his subject, but to write as he did of a material which, comparatively recently, was extolled in a Presidential address before the British Dental Association as a "reliance," and which has made "clinically" a record second only to "coin amalgam" in the *saving of teeth*, is so glaring an illustration of Dr. Black's peculiar methods of "experimentation" that attention may profitably, perhaps, be directed to them.

In the first place, *as usual*, he "had for examination a number of specimens of the material *as furnished by the trade*,"

(italics mine) instead of properly making for himself a sample of such material as had *made for itself* a record of half a century.

He then proceeds to manipulate, *a la Black*, and not in the least *a la anybody else*, to determine how many pounds pressure would be required to *crush* a test filling, utterly ignoring, as a matter of not the least moment, the fact that in fifty years of proper trial no one had ever known of one filling having been *crushed* in the using

And such mixes and manoeuvres with these "specimens" never, had before been heard of.

Masses were "prepared," well kneaded and laid aside—then at intervals of two days again prepared, and so worked on, showing a marked decrease in *resistance to crushing pressure*—and these results brought him to another of his remarkable "conclusions."

This was, that "this deterioration is sufficient to deter me from making use of any residue of copper amalgams in the future."

It counts for nothing with him that "copper amalgam" with those who are accustomed to using it, has given results which make it a reliance to them in time of need; with him it "seems to have failed in the clinical trial of it in filling teeth."

It counts for nothing that the habit of utilizing the "scraps" of "copper amalgam" has been universal with those who use it, and has been so for generations! and without any apparent reasons for its discontinuance having been observed; as the results of his "thorough," "wonderful," "magnificent," "exhaustive" "scientific" *crushing!* will deter *him*, from making use of any residue of copper amalgams in the future!

One might naturally ask why, with such almost universal "washing out" and with the failure which has seemed to attend its trial in filling teeth, he should ever waste time or energy upon copper amalgam when we have so many filling materials that have seemed, clinically, to subserve an acceptable purpose; and the more does this question become pertinent when he has definitely "*concluded*" that "there is no basis for the selection and adaptation of filling-materials to soft teeth, hard teeth, frail teeth (in structure), or poorly-calcified teeth."

But there appear to be discrepancies in the *scientific* consideration of copper amalgam; for it is stated that he thinks "it is generally acknowledged that copper amalgam fillings retain good margins, when they are once made good, better or more perfectly than any other filling material."

This is surely a peculiar "think," for although I *think* that the "piece to piece" gold fillings largely introduced at present, are not to be credited with any remarkable maintenance of good margins, I also *think* that when a soft foil gold filling is "once made good" its retention of *excellent* margins is *unexcelled*.

"Copper amalgam does not flow," see *Cosmos*, Sept. 1895, page 739. What a comforting assertion this must be to those who regard "flow" as an attribute of paramount importance: but how completely worthless must this statement be to those who regard "flow" as an attribute unworthy of the least consideration; and this especially in view of the dreadful "washing out!"

For more than twenty years the *notable* control of copper over the shrinkage of amalgam mass has been known and taught as one of the results of "New Departure Corps" work, and now this attribute is *re-discovered* in the use of the "Wedelstadet steel test-tubes!" Truly a "remarkable" performance, and "eminently" illustrative of the "wonderful" progress of "science."

It is beginning (but only *beginning*!) to be explained how it was that this "work" was so enthusiastically received and so rapturously applauded by those eminents who, even yet, "seem" to *know* so very little about even that most useful of all "plastics," amalgam.

No wonder so many of the "leaders" in dentistry (stomatology?) regarded this "first scientific effort" in its direction as "magnificent"; as a "remarkable" (in *this* they are right) line of experiment; as a "valuable contribution to dental literature"; as a "milestone in the future progress of dentistry"; even as "paralysing"; for it was all *new* to them, and so *strangely new* that it astonished them, as a sort of dental "liquid air!"

No wonder they thought it "exhaustive."

And what is the summing up of all this "copper amalgam" work? Page 740—"From the foregoing it is easy to understand why copper amalgam fillings, when well placed in properly-prepared cavities, retain their perfect margins and the color of the tooth structure."

What a compliment this is to those dentists who by their use of copper amalgam for so many, many years, have gained for it its enviable clinical record; but, on the other hand what a scathing arraignment of those in whose hands "copper amalgam seems to have failed in the clinical trial that has been made of it in filling teeth."

Clearly this *must* have been due to one of *three* things: either to the "specimens furnished for examination by the trade"; or, that the fillings were not "well placed"; or, that they were not introduced into "properly-prepared cavities"

How is this for the phenomenal "progress" of latter day dentistry? But the last paragraph of this copper amalgam "science" is the paralyzer!

When copper amalgam "has once hardened in adaptation to the walls of the cavity, the adaptation is permanent. It does not suffer change of form under stress; and if the cavity has been properly prepared the tooth material is strong enough to support the filling against the stress of mastication."

This last statement is *peculiar* in view of the fact (page 738) that when his specimen material was worked dry as possible, *as it always should be*, it "bore a stress of from two hundred to two hundred and fifty-five pounds."

One would think that, under such circumstances, it might be able to support itself, without any aid from the tooth material!

But now comes an unqualified assertion which I regard as fortunate, for the work of saving teeth, that it comes from so *questionable* an "authority" as Dr. Black. He says "These physical conditions give copper amalgam fillings permanence, and fully explain that which has been seen in clinical observation. The power of the material in the arrest of caries is in these physical properties, not in any chemical or disinfectant property of the copper or its salts."

This is merely Dr. Black's "say so," and surely is ample ground for discussion.

REVIEW OF THE WORK OF PROF. GREENE V. BLACK, M.D., D.D.S., Sc.D.

BY J. FOSTER FLAGG, D.D.S., SWARTHMORE, PA.

[PART SIXTH.]

It seems to me proper to commence this paper with a repetition of the concluding lines of "Part Fifth," for I desire in this way to impress them for consideration as, in my opinion, they embody a definite individual attack upon the only *theory* for the saving of teeth by *appropriate* filling materials that has ever been given to dentistry—

Dr. Black states that when copper amalgam "has once hardened in adaptation to the walls of the cavity, the adaptation is permanent. It does not suffer changes of form under stress; and if the cavity has been properly prepared, the tooth-material is strong enough to support the filling against the stress of mastication. These physical conditions give copper amalgam fillings permanence, and fully explain that which has been seen in clinical observation. The power of the material in the arrest of caries is in these physical properties, not in any chemical or disinfectant property of the copper or its salts. These physical properties recommend this material so highly that it seems to me to call for a further study of the modes of production for the purpose of obtaining the material of maximum strength, and for the discovery of means of obviating the wasting from the surface of the fillings. In the first of my study of the material, as has been mentioned, it struck me that the wasting might be due to the looseness of the cohesion of its particles, or that it was purely a physical wearing away that could be obviated by a better mode of preparation. Further study, however, has caused me to doubt this. It seems more probable that the cause of the difficulty is a question for the chemist."

Shade of Sullivan! that these should be the "conclusions" of the "only *scientific* investigation" of copper amalgam after *yours* has been doing acceptable service for an entire generation.

"A question for the chemist!" This may be the Black-

sonian method of shifting the responsibility, but "the chemist" does not seem to materialize.

But there is vastly more than such trifles as chemistry might settle, in these lines of Dr. Black. The whole Palmer theory of "Consonance of Potential" is scattered to the winds!

It would certainly not be in place to *discuss* this question here, but I wish to emphasize what seems to me *a mere assertion* as contra to the satisfactory, and almost universal, saving of teeth, which has resulted from the acceptance of that theory and from teaching its practice as the *basis* of all the "New Departure" work.

For more than twenty years the two theories of "failure from imperfect adaptation of filling material" and "failure from disonance of potential between filling material and tooth-bone" have been before "the profession," and what has been the result?

Gold, worked in the "highest style of the art" is, even yet, lauded by *some* (not many!) as, in all cases, the "best"—the *plastics*, worked by the incompetents, the inferior operators, the cheap dentists, the slovenly men, have come to be the practical champions, for the "consonance of potential" theory, and, with all their objectionable attributes, with all their "leakage," their "loss from attrition," their discoloration," and their "unsatisfactory" results! I would ask is gold in the majority numerically? are not plastics, with "all their imperfections" steadily gaining in relativity as to using? and are teeth less well preserved than formerly? and yet, in the face of all this we are told, categorically, that closeness of apposition and permanence of adaptation are the conditions which "give copper amalgam fillings permanence and fully explain that which has been seen in clinical observation "which brings us naturally and *very satisfactorily* (?) to Dr. Black's first assertion "copper amalgam seems to have failed in the clinical trial that has been made of it in filling teeth."

Perhaps it may be correct to style *scientific* investigation "admirable," "magnificent," "astounding," "profound," and "milestoneian," but it seems to me that "paralyzing!" suits it best!

For Dr. Black's "Examination of Gold," (*Dental Cosmos*,

September, 1895, Page 740.) I have nothing to say as, after carefully reading the more than sixteen pages, I found nothing of interest to me or to the work I have been doing for the past *twenty-five years*.

During all this time I have had no teeth to care for except such as entail very expensive, very painful, very fatiguing, and not altogether very satisfactory results, when the efforts are made with gold, even when worked by the best operators—as I have known them as the “best”—it has therefore been but reasonable that I should not have used gold in my practice as a filling material, so I leave these sixteen pages without comment and without regret!

In the *Cosmos* for January, 1896, we have a paper which purports to give “The Effect of Oxidation on Cut Alloys for Dental Amalgams,” and again I am referred to as saying that “no amalgam is fit for use until it has been cut at least two months.” (Plastics and Plastic Filling, Page 65.)

I wish it distinctly understood that I should be ashamed to quote Dr. Black as incorrectly as he quotes me, but I should be more ashamed of myself if I were in the habit of writing as loosely as does Dr. Black even when he attempts to *quote*.

I have given, I think, sufficient instances of loose writing, incorrect statements, erroneous apprehensions, etc., in my reviews of these papers of Dr. Black, but I recognize that these short-comings are individual attributes and temperamental peculiarities, but I cannot do other than condemn a quotation given in any other words than those of the quoted author—and I never write amalgam when I mean alloy, nor alloy when I mean amalgam.

My views regarding cut *alloys* were formed from frequent and long continued testings, as to *practical results*, and twenty years of added experience has only served to confirm them, my reasons for preferring them “aged” rather than “fresh cut” being that the “working quality” during the making into amalgam and during the introduction of the filling was decidedly improved, while the more deliberate setting; the sufficient edge-strength; the equal maintenance or loss of color (as desired) and the non-importance of the variation in shrinkage experiments were regarded as confirmatory evidence of the

value of "ageing."—

Dr. Black continues in his usual assertive way by saying that "This *ageing* is nothing more nor less than a slight oxidation of the cut alloy brought about slowly at ordinary temperatures by more or less contact with the air, and I shall drop the term *ageing* and use the better term *oxidation*."

Note—It may be well to say here that after eleven months and the giving of eight pages of such experiments as would seem appropriate pastime for one of ample means without amusement, Dr. Black states definitely that "oxidation has nothing to do with it,"—*Cosmos*, December, 1895, Page 969.

It is unquestionably proper for Dr. Black to say that what he has said is not so when he finds *that* out, but it would seem "better" not to say a thing until the thing was found to be so, especially when it is stated definitely that these contributions are the results of "scientific investigations" and "the profession" so *needs science*.

Dr. Black then says that "any means that will rapidly induce such a degree of oxidation as will occur normally at common temperatures within two to four months, produces like results."

He then says "It may be done by subjecting the cut alloy to boiling water for a few moments, or, for a greater effect, from ten to fifteen minutes and then drying at room temperature," and all *this* is given without any acknowledgment that this "heat ageing" is from "plastics" also, where *fifteen years ago* it was given and credited to Dr. J. F. Siddall, who suggested it.

Not only is this method of "ageing" (which I will yet submit as the "better" term) given in "Plastics" but *heat* and *time* are the only agencies which have been used for "ageing" from that time to this; indeed, if careful note is made, it will be found that *everything of any value*, methods, formulæ, attributes, etc., pertaining to amalgam in Dr. Black's papers has been given, long since, by "New Departure" experiments and teachings, while the remainder will be criticised, *seriatim*, as it has been contributed and published.

It is depressing to meet constantly such statements as "it would appear that good non-shrinking alloys containing other metals, as gold, zinc, etc., may be made, though some changes in formulæ will be required," or again, "From all that I have

thus far seen it appears that we must give up soft, smooth working alloys if we are to have amalgams that do not shrink " for, on the one hand, it would seem that " science " *should suggest* some desirable changes in formulæ, while on the other it appears that the " shrinkage " is the monster which ever appals the " scientist," or again, " Mercury is not the element that causes the shrinkage of amalgams " !! surely one might suppose that the Sphinx was doing business, so oracular are these enunciations.

Who ever thought it was the mercury?

Or again " the usual methods of washing with ether (?) or alcohol proved to be of no value though apparently much oxid was removed."

It is only about *twenty-five* years since this was *taught* in the Philadelphia Dental College, and it is more than twenty years since Mr. Fletcher, of England, demonstrated even more, that it was *detrimental*—so it does really seem quite time that Dr. Black should tell us of it.

And now for the grand *finale* of this January paper. " It is evident, from the results of these tests, that changes must be made in the commercial handling of this material."

It is *this*, then, which has caused this terrible upheaval in the ways of doing the " alloy business !"

It is no wonder that this branch of the supply houses has been shaken to its center !

And *what* is this tremendous change that has occurred—and all from this work of Dr. Black's ?

And echo answers " WHAT !"

REVIEW OF THE WORK OF PROF. GREENE V. BLACK, M.D., D.D.S., Sc.D.

BY J. FOSTER FLAGG, D D S, SWARTHMORE, PA.

[PART SEVENTH.]

WE have now reached that contribution to the December *Cosmos* of 1896, to which I have referred as "a tidal wave of scientific scintillation" and it now remains to show *why* I so regarded it. But first I desire to note the paper read before the New York Odontological Society, January 21st, 1896, by Dr. Black as being his next effort, together with the discussion which followed and to say that the entirety might, I think, be re-discussed with much profit to that important factor of the future—the coming generation of dentists!—Some years ago a gentleman in discussing amalgam said that certain points had been *definitely settled* by experiments done under Governmental auspices at Washington by request of Dr. Patrick. In reply to questions regarding these, I have Dr. Patrick's letter stating that "no such experiments were ever done!" In like manner Dr. Black states that "Dr. Brown, of Duluth, only a few years ago, estimated the average endurance of fillings" (gold) "at three years." I have Dr. Brown, of Duluth's letter saying that such a statement is quite contrary to what he believes to have been his own experience. I only refer to this as another of the inaccuracies which so frequently mar the absolutely *scientific* perfection of the line of "work" which I am reviewing, and which, it might seem, ought to have been known to those who have used their eminently extolling adjectives before they so exuberantly indulged.

The December, 1896, article on "The Physical Properties of the Silver, Tin Amalgams," 26 pages in length, after the usual verbose introduction, states that "The end and aim of this work was to find the means of keeping cut alloys in good condition for use, for it was certain that by the mode of handling in vogue there could be no certainty that an alloy sent out in good condition by the manufacturer would reach his customer in suitable condition for filling teeth."

If there is any *science* in the art of stuffing "men of straw"

for the purpose of standing them up to be knocked *at*, it seems to me that Dr. Black is a "Master" in such work, for to read him, it would appear as though he was trying to *get at the reason* for the sack-cloth and ashes which has so covered the making and dispensing of alloys, and has so depressed the "customers" in their unfortunate and dreadfully unsatisfactory using of them as made into amalgam, that practically, alloys have ceased to be purchased, and amalgam has naturally become an obsolete filling material!

It is all because his "experiments" have shown that notwithstanding the perfection of original manufacture of alloys, the mode of handling in their distribution gives no other certainty than that by the time they reach the customers they will be unsuitable for making material with which to fill teeth.

It surely does seem a pity indeed that this was not found out before so many *hundreds of tons* were used in the futile efforts to save teeth, but it is "better late than never" even though "the profession" *has lost* that which for so many years was so foolishly regarded as a valuable (?) filling material, "*when used with proper care and discrimination.*"

So much for that "man of straw."

But how can comment be made on the "work"—which was detailed at length in six pages—except that it was probably one of the most singularly ingenious, and the most patiently painstaking line of experiments to *find out something without finding out anything* that is on record in the annals of dentistry.

Among the hundreds I have asked about these experiments I have not yet found *one* who had read them closely enough to give me an opinion of them; but, that they were utterly impractical, and that they accomplished nothing of value, is the record which I find as the result of their careful perusal.

And yet it was these which finally induced Dr. Black to state definitely that his "better" term of "oxidation" for that of "ageing," that eleven months before he said he would "drop," was not a better term for he now states that "Oxidation has nothing to do with it." Page 969.

And now, having finished all this, he says, "Indeed when I came to analyze my findings I had not yet learned much about

the matter," with which I think we can all agree, but as all the evidence seemed to point to *temperature* as a factor capable of producing this change in cut alloys, which has always been known simply as "ageing," Dr. Black began to make "preparations for the study of thermal influences on cut alloys in a methodical way."

Naturally the first adjunct taken into the service was an "ice plant," which together with a "south window" and some "incubating ovens" certainly was a sufficiency of apparatus; while as the result of the work done it was found that "shrinkage"—notable shrinkage—1-1000th, was the usual result of "ageing"—but all this was with three metal amalgams—Silver 65;—Tin 35.

Among the many "best" alloys in the market there *may be one* which is made from that formula, but among the dozens which I have analyzed, or had analyzed, I have never met it. And it would seem that either a "chemist" or a "scientist" could have suggested "some change in formula" which would have overcome the difficulty—but instead of this comes the ever recurring groan, "It is little wonder that amalgam has been an uncertain filling material"—

Just as though it has been! instead of having proven itself, as Dr. J. Washington Clowes has so truthfully said, to have "come in the order of the Divine beneficence to supply an imperative need."

But now I find another something, which is that "In his work on plastics and plastic fillings, Dr. Flagg states that alloys may be aged by shaking in a bottle."

As I do not remember ever to have shaken any alloys in a bottle for any purpose whatever I was surprised to find myself the basis for the experiments which followed, but as they seemed to prove that even violent and long continued shaking of alloys in a bottle would not produce the effect which has for so many years been obtained by *heat* and by *time* I do not like to be charged by Dr. Black with saying that it would, for I *never said so*.

If Dr. Black had read me with "one ten thousandth" the care I have taken the trouble to read him, perhaps the "Kellogg Bros.' machine shop" and the "*Wright's noiseless doffer*"

comb on second breaker," would never have been brought into requisition, but as they have been I am perfectly willing to accept Dr. Black's statement that this tremendous shaking does not "age" alloy, as I never had any reason to suppose it would.

It seems as though Dr. Black has at last found out just what *we have always known*, viz. that *heat and time* will "age" alloy—but this at best is only *corroborative science* for, as I have said, so far as I know, no other means are ever employed.

But now the "scintillations" begin to crop out, for the matter found on page 973 has but few parallels in dental literature—I certainly think that every dentist should read it carefully if only to be *positive* as to what kind of material is regarded, editorially, as "likely to serve as a milestone in the future progress of dentistry."

For my part I will say that with the two exceptions of the "Harvardian method of making Gutta Percha stopping" as given by H. C. Meriam, D. M. D.; on page 48 of the *Cosmos* for January, 1887, and the teachings regarding "asepsis and antisepsis in practice" by W. D. Miller; M. D.; D. D., S.; pp. 1, 2, 3 and 4 of the *Cosmos* for January, 1893, from the "Cleansing of the Hands" to the "Drinking Glasses" thoroughly rinsed in hydrant water! I do not know of any contributions that rival it.

He says: "Perhaps it would be well before going on to the next step taken in this work to state briefly the plans of manipulation adopted in making test fillings. The material for each filling is weighed as closely as one twentieth of a grain, and with the formula, silver 65, tin 35, the proportions are fifty per cent. of alloy to fifty per cent. of mercury. This is partially amalgamated by stirring (not grinding) in a mortar until all of the cuttings are engaged with the mercury. This is to prevent the loss of material that will occur if this part of the mixing is done in the hand. All of the work is done over a sheet of clean white paper so that loss may be prevented. Now the mix is turned into the hand and kneaded to softness. In every case, no matter what the alloy, this mass must be soft enough to readily take good impressions of the skin markings of the fingers without being sloppy to knead. A mass that is sloppy

soft cannot be properly kneaded. When a strange formula is taken up, the proportion of mercury that will do this is to be found by experiment before fillings are made, or if from any cause, such a mix is not obtained, the mass is thrown aside and a new one made.

The kneaded mass is now weighed to see if any, or how much, loss has occurred in the mixing, and the record made. It is particularly noted as to whether there is any, or how much, stiffening of the mass during the time of the weighing, as indicating the quickness or slowness of the setting. These records being made in brief, the mass is again turned into the hand and kneaded, in case a little stiffening has occurred, into condition for wringing out the excess of mercury. It is then wrapped in strong muslin, so that a good hard-hold can be had to either end, and twisted with about all the strength of my hands. The mass usually made for these test fillings weighs one hundred and forty grains when blocks for trial of flow and crushing stress are to be made, or one hundred and twenty to one hundred and thirty grains when only the tube filling is to be made; and it requires about three times the power to produce the same dryness in a mass of this size as the usual mass made for filling teeth. Now the mass, as wrung out, is again weighed to determine the amount of mercury lost. After this record is made, the packing of the filling is proceeded with, using a very broad serrated point for the main portion of the work, but going around the margins with a smaller instrument, being careful to use only such force as will compress, and not cut into, the material. If in packing the surface of the material becomes soft or muddy, it is dried out by heavy pressure with a large rubber point that when strongly pressed upon, just fills the diameter of the cavity. The cavity is filled more than full, and dressed down level, and then a steel disk one-hundredth of an inch thick is pressed into the surface in the center of the filling, as a contact point for the micrometer in taking measurements. Amalgam is again packed on the surface of the filling, and it is again dressed down level and finished as perfectly as possible, so that its margin may be in the best practicable condition for microscopic examination. The filling is not touched afterward."

I close this portion of my "Review" with this quotation that it may be read and digested by those amalgam workers whose results have *not* shown it to be "an uncertain filling material," whose work has *not* been so "universally unsatisfactory" AND WHO, BY A RADICALLY DIFFERENT METHOD OF MANIPULATION FROM THAT EMPLOYED BY DR. BLACK HAVE COME TO REGARD THIS PLASTIC AS THEIR BEST RELIANCE FOR THE SAVING OF THOSE TEETH WHICH DEMAND THEIR MOST STRENUOUS AND EVEN MOST HOPELESS EFFORTS.

REVIEW OF THE WORK OF PROF. GREEN V. BLACK, M.D., D.D.S., Sc.D.

BY J. FOSTER FLAGG, D.D.S., SWARTHMORE, PA.

[PART EIGHTH]

As I have said, I closed the seventh portion of my "Review" with the "plans of manipulation adopted in making test fillings," as given by Dr. Black, that it might be again read by amalgam workers.

It must be admitted that of all amalgam work "*test fillings*" should be made as amalgam should be worked for the purpose for which it is used, and I would ask

FIRST. What is the need or advantage of weighing the materials for making an amalgam mass of from 120 to 140 grains (from 5 to 6 dwts!) "as closely as one-twentieth of a grain?"

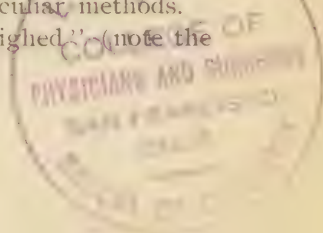
As the proportions given are equal parts of alloy and mercury it would give us 60 or 70 grains of each, and would it be *possible* for any "test" to distinguish between an amalgam made from 60 grains of alloy and 60 grains of mercury and one made from 59 grains of alloy and 61 grains of mercury, or from 61 grains of alloy and 59 grains of mercury? I have made such, and though I did not test for either "crush" or "flow" I did test for *every attribute pertaining to practical work* and can say that the two makes were much nearer alike than are, usually, amalgams that make good, satisfactory, everyday fillings.

This, with me, would put the "one-twentieth of a grain" weighing, in the category of absurdity rather than in that of "science."

It is then stated that this mingled alloy and mercury is to be "partially amalgamated by stirring (not grinding) in a mortar."

If the next thirteen lines do not *speak for themselves* I feel utterly incompetent to speak for them, for, I think it will be conceded by all experienced amalgam workers, that if the utilization of this "plastic" had been left to such directing hundreds of thousands of teeth now saved would have been lost, as few would have adopted any such peculiar methods.

SECOND. "The kneaded mass is now weighed" (note the



weighings and for what purposes) "to see if any, or how much loss has occurred in the mixing," and it is particularly noted about the stiffening of the mass *during the time of weighing* as indicating the quickness or slowness of setting! Verily we must say "*vive la humbug*." All these records having been made we are ready "for wringing out the excess of mercury."

For 60 years at least the chamois skin has been used as the medium through which to express the excess of mercury, and for more than ten years it has been *known* that by this means nothing but mercury is taken away, and, that the amalgam is composed of the metals originally introduced plus the mercury remaining.

It has long been known that the mercury expressed, which has been facetiously styled a "fluid amalgam," is about as much *that* as would a tiny lump of sugar make an hogshead of water *can sucre!* and yet "science" has relegated the chamois skin and the wafering plyers to the shade and the amalgam mass of Dr. Black "is then wrapped in strong muslin, so that a good hand-hold can be had to either end, and twisted with about all the strength" of his hands.

This may be one of the indications of the "vast progress" made by "the profession" during the recent past.

THIRD. "Now the mass, as wrung out, is again weighed to determine the amount of mercury lost."

It really seems as though *time* was a factor of not the slightest importance in "scientific" testing work. It would seem as though the introduction of the amalgam would be in order after it was ready for use by the wringing out of the excess of mercury—and it would equally seem reasonable that the amount of mercury *lost* (?) could be determined by weighing *it*, and that this could be determined any time that day, or that week, or that month, without stopping to weigh the mass for that purpose—so we have to suppose that the method given is the "scientific" way of doing it.

FOURTH. "After this record is made the packing of the filling is proceeded with, using a very broad serrated point for the main portion of the work, but going around the margins with a smaller instrument, being careful to use only such force as will compress, and not cut into, the material." And *this*

is Dr. Black's method of introducing an amalgam filling.

Forty years ago I remember to have used, as did many others of those days, serrated instruments for packing amalgam, but I also remember that we gradually changed to smooth ends, and, that for the past twenty-five years, I have known of no one who was using smooth ended pluggers that has ever changed back to serrated points. It is possible that this method of operating may account for the time expended in making a filling—(from 25 minutes to over an hour!) but I should regard any method which entailed such unnecessary expenditure of time as unworthy any consideration and not likely to have any extended adoption.

By actual experiment the weighing, mortar rubbing, kneading, introducing, wafering (twice or thrice) and finishing of an amalgam test filling, weighing 160 grains of material, should consume about 25 minutes. If of 60 silver—35 tin—5 copper alloy, and the "make" is equal parts alloy and mercury, the expressed mercury would be about 25 grains and the refuse amalgam about 5 grains.

FIFTH. "If in packing the surface of the material becomes soft or muddy, it is dried out by heavy pressure with a large rubber point that when strongly pressed upon, just fills the diameter of the cavity."

This method is not only ingenious, but, in actual practice would seem to be especially well adapted for fillings to be introduced upon the distal faces of lower second molars with the third molar in place! And finally, "the cavity is filled more than full, and dressed down level," and then the one-hundredth of an inch thick steel disk is pressed into the surface, and then "amalgam is again packed on the surface of the filling, and it is again dressed down level" and "the filling is not touched afterward," and no mention is made of weighing the amalgam thus discarded nor of the material ("fluid amalgam!") lost in drying out the "mud" by the heavy rubber pressure. Surely the excessive accuracy of the commencement of this work is in remarkable contrast to the seeming carelessness and utter disregard of material at its conclusion—but this is *astoundingly* endorsed as "science."

But now having used all this space and given all this minutiae

Dr. Black tells us that when he came to study alloys having a larger proportion of silver—though one might suppose that 65 silver would practically cover the ground of to-day—that such might even require to be “*ground in the mortar*” to obtain the best strength—as though any were not plenty strong enough—and the best working property.

As I have *taught* this for more than twenty years, and as Dr. Black has so misrepresented me before, it seems to me that it would have been appropriate in this connection for him to have said—as Dr. Flagg has said in “*Plastics*,” p. 90, and has TAUGHT for so many years!

And now after another page or two Dr. Black definitely accepts the two *old conclusions* or “strongly intrenched empirical notions” that heat and time will “age” alloy, and that he will use the term “annealing” when artificial ageing is meant. This term has, at least, the merit of great originality, as the process of softening metals, which have become hardened from any cause, by *heat*, is so seldom called “annealing!”

But what is this “scientific scintillation” which we find on p. 976?

It is an “explanation” which is suggested briefly as a scientific reasoning as pertaining to this peculiar study of the “ageing” of alloy.

“In the cutting of an alloy the violence used hardens it, producing an allotropic condition of the metal, in which its chemical relations to mercury are profoundly changed. High temperatures, or even ordinary temperatures acting for a considerable time, have the effect of annealing the cut alloy and restoring its normal condition.”

It seems to me that these few lines will bear considerable study, for as an example of high style, scientific *science* they appear to be almost unapproachable.

What do they mean?

How do they explain?

They remind me of old uncle Zeke’s “explanation” of the mysteries of creation:—

“De katerak ob de heabenly bodees, and de flow ob de loona seezuns, kondistutes de *ontire* wampus ob de univess”

And now I would ask, *seriously*, is there not just as much

sense in the one as in the other ?

"Allotropic" is a good word to begin with ; it is so *definitely* descriptive of the result recognized ; but it is feeble in comparison with "profoundly," for that word so *accurately* measures the extent of the change which has taken place ; but the culmination of elucidation is found in the information given as to *what it is* that is so changed. It is the metal's chemical relations to mercury !

Just as though anybody knows anything about the *chemical relations* existing between the metal and mercury.

And it is such material as this for which "Pointers" are given a whole year in advance ! as "evidence that the spirit of scientific inquiry is wide awake," and that the Muezzin is *way up*, on the very pinnacle of the minaret, "alert to bear the tidings of its discoveries to the dental profession."

What a record !

We have then, with all its meaningless ambiguity, an "explanation" of the youthfulness of freshly cut amalgam alloy.

It is "an allotropic condition of the metal, in which its chemical relations to mercury are profoundly changed" !

It is a fortunate thing indeed for dentistry that this allotrophia, and these undesirable "chemical relations to mercury," can be so "profoundly" removed, either by "time ageing" or by a *few minutes of gentle heating*, as suggested by Dr. J. F. Siddall, and *accredited to him sixteen years ago*. See "Plastics" Appendix, Section 1.

REVIEW OF THE WORK OF
PROF. GREEN V. BLACK, M.D., D.D.S., Sc.D.

BY J. FOSTER FLAGG, D.D.S. SWARTHMORE, PA.

[PART NINTH]

After having given us the "explanation" relating to fresh cut alloy to which I referred in my last paper, and which Dr. Black called a "thinkable" one! we reach a *peculiar* part of even this startling portion of these contributions to the "wide awake spirit of scientific inquiry."

This is nearly ten pages of what to me was the most tiresome to read of all the records of this work; and it seemed as though this was due to the evidently earnest effort to *get at something* which was so "willow-the-wisp-y" as to be simply fatiguingly elusive, and that *therefore* the "work" amounted, practically, to nothing.

It appears to be an attempt to *systematize* either Dr. Siddall's idea of "heat ageing" by boiling water, or, by "dry heat ageing" (solar or oven) and thus accomplish a definite result.

Dr. Siddall's method is utilized "by placing the cut alloy in a small flask blown on the end of a glass tube a foot or more long, and immersing the flask in boiling water."

When it is known that Dr. Siddall's method is equally well utilized by every possible way of subjecting "fresh" filings to boiling water heat, from merely putting them *into* the water and afterward pouring the water off and letting them dry, to placing them into "any convenient receptacle" (Plastics, Appendix, Sec. 1,) as a tin cup, or kettle, as a few ounces, or hundreds, of alloy are to be "heat aged" and then partially immersing it, the particular need for the blown glass tube or any other special piece of apparatus would appear questionable.

As I have said, it seems to me that for the most part (and very largely the most) the work detailed in these ten pages amounts, practically to nothing, and it is therefore difficult to explain *why* it is that Dr. Black expends so much time, thought and energy upon *impossible* alloys, unless it be from an invin-

cible desire to obtain an unmodified silver-tin amalgam for filling teeth.

This, of itself, would appear to be so utterly impracticable as to place work for obtaining it in the list of "useless."

However, for a first *discovery* (?) it was stated that an alloy can be *over-annealed*; while the danger from this is said to be its "gravitating back to a condition of expansion."

Compare this result with that warning given by "New Departure" work nearly twenty years ago—(Plastics, Appendix, Sec. 1.) "An excessive degree of heat will render fresh fillings of 'excellent' quality, almost completely devoid of 'setting' power."

Which is the more important warning?

But thus it is, in all Dr. Black's work the basal considerations are so different from those which have always been paramount with me, and, I think, with all who are extensively conversant with amalgam, that it entails discussion by *contrast* rather than by *comparison*.

Tests for "crush" are *first* with Dr. Black, while as I have never seen *one* properly prepared and introduced amalgam filling "crushed" under mastication, it would be a test I should never think of making.

I have given my views on "flow" and it, as a test, I should regard as of not the *least* importance.

Expansion and shrinkage I have referred to as attributes constantly looming up like giants before Dr. Black, while the *modified* alloys of the past twenty to twenty-five years have actually relegated those considerations absolutely to the shade.

What then is the use of continuing page after page of experiment upon unmodified silver-tin alloys?

Why not take amalgams so made as that they make fillings *which will not leak*, as has been *demonstrated* for twenty years, in fillings ten times as large as the largest human tooth?

Why not take amalgams that are known to shrink, when the shrinkage is almost infinitesimal, and never has been proven detrimental, and by many is regarded as advantageous by favoring the sulphiding of the filling and of the contiguous dentine?

But it is regarded as *nothing* by Dr. Black that such discolored and discoloring fillings have saved their "forlornities" of teeth for thirty, forty or more years—for—the microbes can march in, not by "Indian file" but in serried ranks! to their work of devastation.

Why don't they devastate?

It is because amalgam made from accepted alloys of known formulæ which expands, does not expand sufficiently to be at all detrimental; and amalgam made from accepted alloys of known formulæ, which shrinks, does not shrink sufficiently to be at all objectionable, that Expansion and Shrinkage are no longer regarded as attributes requiring "testing."

Is it not reasonable that *pages* of material devoted to such "work" should be, for me, beneath criticism?

But now, at last, we come, on p. 987 to an "Exhibit of Modified Silver-Tin Alloys" which is indeed subject matter for thought; and as I passed in review, mentally, the solid, basal, metallurgic work of the "New Departure Corps" and the careful, progressive steps taken in the *fifty* formulæ modified from *Townsend's 40 silver, 60 tin, of 1875, to that of 70 silver, 26 tin, 3 gold, 1 zinc of 1888*, and thought of the *varied adaption* of its *three* classes of amalgams, "sub marines" for desperate cases, from copper and coin amalgams to those of lesser tooth-saving ability; "contour" or "usual" for all ordinary amalgam work in reasonably good teeth; and "Facing" for all that line of alloys making what is known as "White" amalgams, I could not but feel *thankful* that the "Corps" to which I owe so much, and for which I have such respect, does not have to carry any such *load* as that "Exhibit" of p. 987 (Cosmos, December, 1896.)

When the results of such combinations as it would be impossible for any but a mere tyro in the amalgam work of to-day to make are viewed by anyone who has had from twenty to thirty years experience in such work, they only serve to show the aimless wandering—to find a path—of one travelling over an entirely unknown region; but to those not at all conversant with such work, what do they tell?

The *dental profession* was to have "tidings" borne to it.

What do these "tidings" tell?

But, again, what is the little, here and there, that they *do* tell to those who, from years of previous preparation, can read them?

MODIFYING METAL,	SILVER.	TIN.	HOW PREPARED	PER CENT. OF MERCURY.	SHRINKAGE.	EXPANSION.
Platinum 5 " "	65	35	Fresh-Cut.	52.33	0	1
	65	35	Annealed.	33.00	10	0
	61.75	33.25	Fresh-Cut.	51.87	0	9
	" "	" "	Annealed.	37.33	7	0
Copper 5 " "	61.75	33.25	Fresh-Cut.	53.65	0	23
	" "	" "	Annealed.	35.60	5	0
Zinc 5 " " "	61.75	33.25	Fresh-Cut.	56.65	0	68
	" "	" "	Annealed.	40.65	0	9
Aluminum 5. " I " I	61.75	33.25	Fresh-Cut.	65.00	0	445
	64.05	34.05	Fresh-Cut.	46.98	0	166
	"	"	Annealed.	38.26	0	48

I have made these few extracts from the entire table as they seem to show the most clearly the *value*—or rather the want of value—and the *advance*—or rather the retrograde—resulting from the work of which this is the "Exhibit."

It will be seen that if *tin* had replaced the *platinum* the results would have been practically alike with, possibly, a little to the advantage of the *tin* in the attribute of expansion.

See "Plastics" p. 60 "so far as is *proven* the value of platinum seems to be *just equal with that of tin.*"

As that conclusion was *published* in 1881 there does not seem much advance.

It will be seen that *copper* when added to 61.75 silver, 33.25 tin, gave the marked expansion of 23, but that when the alloy was *aged* it shrank 5.

It was this condition of things which, *twenty years ago*, led up to the accepted formula for "Sub Marine" of 60 silver, 35 tin, 5 copper, which it will be seen would lessen the expansion while it would rather lessen than add to the shrinkage, but this shrinkage was just what was *theoretically* not objected to by the "New Departure Corps" workers and the tooth-saving quality of this discolored amalgam has been most satisfactorily established by its almost quarter of a century of trial.

The "exhibit" of *zinc* is certainly peculiar! What process of reasoning could induce one to add *zinc* 5 to *silver* 61.75, modified by *tin* 33.25 "the Lord only knows!"

The expansion was, as might have been expected, 68, and one might suppose that the next experiment in regular order would have been *a lighted segar* 1, a keg of gunpowder 99.

40 silver, with 55 tin, *permits* zinc 5, and a most useful amalgam is made from such an alloy.

But it is the aluminum "Exhibit" which is truly the *showing* of how entirely unfitted for this work was the "scientist" who, *according to authority*, contributed papers which went "to the root of the subject under study."

I cannot but believe that if the "investigator" "had attended a "post-graduate" course at *one* of the "South-Eastern" dental colleges he would never have written as he has in the last four pages of the paper I am "Reviewing," and I also think that if the eminent gentlemen who so positively and so unequivocally *endorsed* had only known a great deal more of this kind of work, *their* "exhibit" of themselves would never have been so decidedly in evidence.

REVIEW OF THE WORK OF PROF. GREENE V. BLACK, M.D., D.D.S., Sc. D.

BY J. FOSTER FLAGG, D.D.S. SWARTHMORE, PA.

[PART TENTH]

As I again read the last four pages of this "going to the root" of things it seems to me more pitiable than condemnable that anyone of reputable ranking as a member of the dental profession should have, at this late date, made such a record; but that this matter should have been offered "the profession" under such editorial auspice as was given it is simply a "stupendous" illustration of what was regarded as "mental pabulum suited to the digestion of the leaders of dental thought" (see *Miniature Dental Cosmos*, January, 1896, p. 8; ¶ 3rd.)

In pursuance of his work Dr. Black next states "For some years it has been the habit of many manufacturers of alloys to add other metals, with the view, *I think*, (italics mine!) of improvement in the chemical qualities of the amalgam; though some seem to have had in view the improvement of the physical qualities as well."

As the improvement of the physical qualities of amalgam is the *only* reason I have ever known for adding other metals to Silver-Tin Alloys, *I think* the "chemical improvement" idea is *purely theoretic*.

To the end, therefore, of giving some knowledge *scientifically* in this regard Dr. Black experiments with Gold; Platinum; Copper; Zinc!; Bismuth; Cadmium!!; Lead and Aluminum!!!; upon which work I would comment as follows:—

Gold—While it would be very satisfactory if the statements under this head were of any value I yet feel warranted in saying that the most carefully compiled statistics do not *positively* substantiate any of them, while the vastly more important knowledge as to the *advantage* of such addition is even less assured.

Therefore, as the seven lines of *absolute* statement can only be accepted as *practically* nothing, I think it safer to adhere to

the opinion that *gold* is as yet an "undetermined element." (Plastics, Edition, 1898, p. 51.)

Platinum—In despite of Dr. Black's usual antagonism to such views concerning alloys and amalgams as have been enunciated by the "New Departure Corps" workers, we find every conclusion as to *platinum* in unison with the teachings of the past twenty years, viz., that this metal is *valueless* as a component of dental amalgam alloy; while to this is added a list of some half dozen attributes which are decidedly detrimental!

It seems therefore, in order (?) that "dentistry" should continue to believe that the so-called "Platinum and Gold" amalgam alloys are something fine, and that it should continue making them so *for their manufacturers!*

Copper—If Dr. Black's "tidings" that *copper* markedly increases the expansion shrinkage range; diminishes the "flow!" and makes a "crushing stress" the greatest of the series, surely dentistry ought to give special praise and thanks for these manifold blessings!

Meanwhile it may remain content with the knowledge which has been given it as to the *true value* of this very important adjunct to all "sub-marine," tooth-saving amalgams.

Zinc—In his experiments with zinc the investigators *knowledge* has evidently touched the "zero point" for there is no indication that he has any appreciation of the value or the practical application of this metal in amalgam work.

The continued and marvelous (?) expansion of his peculiarly crude admixture of *zinc* seems to have had an equally peculiar effect upon his views regarding a *danger* as associated with its use for he concludes, in a sort of *resume*, on p. 991, ¶ 2:—

"There seems to be no reason why we should not have white-alloys, but it is clear that we must be very cautious in the use of *zinc* for this purpose."

To show that this is an eminently Blacksonian opinion I can only say that of all the efforts made in the direction of the "White Alloys" none have "tested" so well as those controlled by *zinc*, and that, so far, no "caution" in its use has

been found specially needful.

Bismuth—As an amalgam adjunct *bismuth* amounts to nothing, and as Dr. Black *discovered* only that which has been so well known and *taught*, for more than twenty-five years, that its status was so definitely settled as that it was considered unworthy of discussion in "Plastics" even in its "First Edition the 'tidings'" as to *bismuth* may well pass without further comment.

Cadmium—"This is emphatically the active element," so says Dr. Black, and whatever this may mean to dentistry it will be found strictly correct by all those dentists who, reading that "The amalgam is very white and the fillings are beautiful" may be tempted to try it in filling teeth, for, of all the elements ever used in making dental amalgam alloy this is the one which will make *efforts at repairing damages* most "emphatically active."

Lead—Dr. Black states that his "principal reason" for desiring to know the effect of *lead* upon amalgam was "the fact that our metals are so frequently contaminated with it."

That the very trifling amount of *lead* which is found in "our metals" has no appreciable effect upon even the *finest* of our alloys, may be known from the fact that in the closest analyses of hundreds of makes of alloys I have seldom found *lead* assayed as anything more than "a trace" (which amounts to nothing) and even the most ordinary "stone jug" mercury is sufficiently freed from this contamination by squeezing it through chamois skin.

Aluminum—I have said that it was Dr. Black's *aluminum* "Exhibit" that was the *showing* of his entire unfitness for the "work" he undertook, and the innocence with which he relates his *aluminum* experiences is my warrant for the assertion.

These were just such as have been the lecture-stand demonstrations at the Philadelphia Dental College during the last eight years of my connection with that school.

Surely when one is about to engage in the "*first scientific*" work in any direction he ought, at least, to be familiar with the *crude, unscientific attempts* which have been made in such

connection, and had that been the case with Dr. Black he never would have written "My first attempt to make a filling of the alloy containing five per cent. of aluminum was a failure."

For he, in common with other students, would have known all about the "too hot to handle," "the falling into a dark powder," "the swelling up," and "blistering" of even small additions of this metal to any of the ordinary makes of dental amalgam alloy.

He would also have known that *aluminum* was, up to the date of his experiments, not only of *no benefit* but, just in proportion to the quantity of its admixture, of *decided detriment* to dental amalgam, but he seems to have *known nothing* of all this.

And next, at last, after all this *one hundred and ninety* pages of *Cosmos*, (think of it!) Dr. Black ventures on giving a formula for an amalgam alloy which he says (*Cosmos*—Dec. — 1896—p. 991) "has now been watched long enough to assure its success."

This formula is		N. D. Trial Formula	
Silver	68.5	Silver	68.
Tin	25.5	Tin	27.
Gold	5.	Gold	4.
Zinc	1.	Zinc	1.
December, 1896.		December, 1884.	

It was with mingled feelings of amazement, amusement and regret that I read this p. 991.

Amazement as to *why* Dr. Black had *accepted* that which I (following the work of the "New Departure Corps") had *abandoned* as unsatisfactory.

Amusement at his confident assertion that it had in 1896! "been watched long enough to assure its success;" with a natural wonder as to how long *he* had watched it!

Regret, that he, so evidently, knew nothing of all this, and so unwittingly proclaimed it, as my work was all given, consecutively, in lectures.

Twelve years before (in 1884) the experimental formula of Silver 68, Tin 27, Gold 4, Zinc 1, was devised to meet a

"want" for a "contour" which would not require "wafering" to use in not accessible positions.

This was tried for *two years*, and as the result of clinical experience the change was made to silver 69, tin 26, gold 4, zinc 1, in 1886.

With two years more of trial the change to Silver 70, Tin 26, Gold 3, Zinc 1, was made in 1888, and after *five years* of trial this formula was "accepted" as "J" that letter being its alphabetic position in "contour" formulæ—and, as such, was *taught* to the class of '93 at the P. D. C, *four years before* Dr. Black published his formula.

That "J" is an excellent alloy *for its special use* I certainly do think; that it is a better formula than the one given by Dr. Black, I am sure; but that either are the *ne plus ultra* I equally doubt.

In conclusion Dr. Black states "The subject is by no means exhausted. Besides finding suitable formulæ for white alloys, there is need of much more work in the experimental way before we know all we need to know of dental alloys. But the studies now presented seem to me sufficient for the beginning of a radical improvement in the production of dental alloys by manufacturers."

And, after this, it is all finished with the final grand "tidings" that "operators must depend upon the regular lines of trade for their supplies of alloys, and if alloys manufactured on the lines I have indicated are wanted by the profession I think our manufacturers may be depended upon to produce them. It is their part of the business to supply the material required by the dentist, and in the past they have not been slow in complying with the demand, and we have no reason to expect that they will fail us in the future."

Is not this a powerful ending for that which was heralded and supported by such a flourish of editorial and eminentorial trumpets?

But this is *not the end*—as I shall show in my *resume* of THE OUTCOME OF DR. BLACK'S WORK.

THE OUTCOME

OF DR. BLACK'S WORK.

BY J. FOSTER FLAGG, D.D.S. SWARTHMORE, PA.

Four months (April, 1897) after the publication of the December, 1896 article from Dr. Black an early evidence of an *Outcome* appeared as a "Letter from Dr. Kells" in which the writer took the ground that as the work *already done* by Dr. Black was of "vital interest" to dentistry, and, as an enormous amount of time had been *given* while what remained to be done would require vastly more, neither Dr. Black nor anyone could be asked to do this, unassisted, for the good of the profession at large, and he therefore proposed that the *Cosmos*, though its Editor, should select from its subscription list two hundred and fifty names of the men most interested in the welfare and progress of dentistry who were to be asked to join him (Dr. Kells) in a subscription of one hundred dollars each, thus netting the sum of *twenty-five thousand dollars*, to be placed at the disposal of Dr. Black for such study as should "place upon the market an amalgam that will be absolutely reliable, in the hands of careful operators, when the directions for its use is followed."

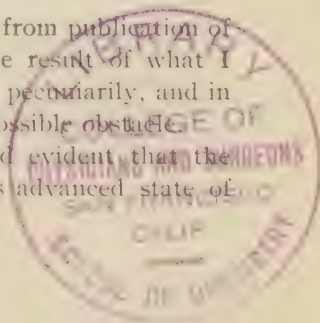
This letter produced two results, *first*, an editorial, in the same issue of the *Cosmos*, upon the "Endowment of Dental Research," a sort of committo—non-committal paper, in which "those who have appreciated the work of Dr. Black" and, an editorial of the *Dental Digest* are referred to, and the opinion given that comparatively recently such a proposition as that of Dr. Kells, "would have been regarded as the vapor-ing of a wild enthusiast."

As a test in this matter the DENTAL COSMOS requested letters from all who would signify their approval of this suggestion of Dr. Kells with statement as to what amount of cash each would be willing to subscribe.

This was to decide whether in the professional progress of dentistry it had reached a point that indicated a willingness for such an unselfish undertaking.

And *second*—It induced the withholding from publication of my "Review" papers until I had seen the result of what I felt might be a good thing for Dr. Black, pecuniarily, and in the way of which I would not place any possible obstacle.

As month after month passed it seemed evident that the "twenty-five thousand" was, even at this advanced state of



the profession—or possibly in consequence of it!—merely “the vaporing of a wild enthusiast” as there never has seemed to be more than a few hundred dollars (four or five) in sight, while the balance, of twenty-four thousand five hundred, was — — !

Thus, after its nine months gestation, this child was practically “still born” and a sad wail came from the *Dental Practitioner and Advertiser*, January, 1898. Poor Miller! Poor Black!—“It is the usual way of the world” — Is it?—As I view it, the world seems to recognize anything meritorious with great rejoicings and, usually, with large compensation.

Of the “Reviews” of Dr. Black’s work as given by the “International” of December, 1897, I have spoken in my “WHAT IS IT” paper, read at the “seventh District” Society of New York, April, 1898—a paper from which I have received *much return* but which, although I *asked*, has never been *answered*, because it is well known that each question had its *wire*, and that I had the *buttons*!

A few months prior to the reading of this paper the first *characteristic outcome* of such work as Dr. Black’s was given to dentistry as the “Fellowship Alloy.” This was stated to be “The Only Perfect Alloy” and was “guaranteed” as superior from “several month’s experience”!

How the professional knowledge of dentistry was advanced by this addition to the already long list of “*best*” alloys it is difficult to discern, and especially so when its composition as published by me in the *American Dental Weekly* for February, 17th, 1898, was intended to be denied but *was really admitted*, as Dr. Crouse said—*Dental Digest*, March, 1898, p. 206. “The analysis of “Fellowship” alloy which you publish is about as nearly correct as you generally get things” which admission, as the analysis was *strictly correct*, I could not regard as other than a compliment.

The Analysis of “Fellowship” as made by Booth, Garrett & Blair, 406 Locust St., Phila., Pa.	}	Silver	67.73
		Tin	26.33
		Copper	4.71
		Zinc	1.23

My "test" analysis was practically the same and gave all the responses from setting test; color test; shrinkage test and edge-strength test that an alloy of such proportions of such metals would do.

Such "tests" showed conclusively that "Fellowship" would have been a better alloy without its zinc; that it did not maintain its color as amalgam as well as other "white" amalgams did, that it was no better as a non-leaker than amalgams which had been in use for more than twenty years and that, all together, its "testings" showed retrograde rather than improvement—but, even supposing that it had been a *very great advance*, in what was *dental knowledge* benefitted by its manufacture? What "tidings" did dentistry receive different from those it had learned from the many advertisements of the makers of *all the best alloys ever since the 70's*?

Next we hear of a "Post Graduate Course" at the "North Western University Dental School," together with teaching in connection with alloy and amalgam work, as though this was a novel adjunct to dental education!

I have yet to learn that these teachings in the making of alloys or in the using of amalgams have been any more acceptable than were those given by me for fifteen years at the Philadelphia Dental College during my occupancy of the chair of which "Plastics" formed a part; while for the "Post Graduate" course I have reason to think that those who know most of it are disposed to say least.

In June, 1898, I felt it my duty, as I have said, to make one voice, at least, heard in absolute condemnation of all this, so called, work of Dr. Black's, *from the beginning to the end*.

I therefore sent the *first* of my "Review" to our California State Dental Association as my annual contribution to its papers, and from that time to this have continued showing—as I believe—the fallacy of attributing any value to Dr. Black's contributions in this regard, and, as well, what folly it would have been to have invested money by *tens of thousands of dollars* in the continuance of any such experimentation.

But now, during the last few months a series of *object lessons for dentistry* has added its quota to the thoughts of those

who think, and has given much "mental pabulum suited to the digestion of leaders of dental thought."

These are the continued production of marvelous amalgam alloys from "REGO" to "20TH CENTURY" all made from instructions by Dr. Black by some of those who have been giving the profession such eminently satisfactory products for almost a quarter of a century !

And what are the "tidings" from these ?

The leaps from "The Only Perfect" to *far better* and decidedly *the best*, are so frequent and so long that, together with the histological and associate investigations they may well stamp this as the "kangaroo" period in the progress of dentistry. *

But what are the "tidings" ?

Any discussion of the various alloys offered to dentistry *as the results of Dr. Black's work* other than as they stand as proof of *scientific progress* of "the profession" would be foreign to the purpose of this paper, but it surely is pertinent to ask of what advantage it is to dentistry to know that any manufacturer had learned that Dr. Black was a "Past Master" in the making of amalgam alloys and that *therefore* if "REGO" was used the saving of teeth was a positive sequence. What is "REGO" ? A reference to the analysis of "Fellowship" (Booth, Garrett & Blair) is interesting when compared with the analysis of this remarkable alloy.

"Test" Analysis of "REGO" alloy.		Booth, Garrett & Blair.	
Silver	65	Silver	66.54
Tin	28 or so	Tin	28.14
Copper	5	Copper	4.21
Zinc	1 x	Zinc	1.06

This begins to be something in the nature of "tidings" but until now *dentistry* has known only that this "specialty" has become very popular in a very short time; that it is "compounded of metals of unimpeachable purity" and is made "*after the methods of Prof. Greene W. Black*" (italics mine.)

The more intelligent and scientific members of "the profession," especially the "conscientious dentists" will recog-

* Dental Cosmos, April, 1897, p. 343.

nize the advice, so long familiar in varied directions. "be not persuaded to buy some so called "Black's alloy" represented to be 'the same thing' or 'just as good,' but dentistry itself had no time to even partially recover from the delight of all this scientific information when "TRIUMPH" alloy appears in the arena as *another* of the results from the "milestone in the future progress of dentistry."

This alloy was given in the Dental Review of *February*, 1899, as a direct following of Dr. Black's work. In *March* it was "an alloy made from an entirely new formula." In *April* nothing was said of it; In *May* it was yet "an alloy made from an entirely new formula." In *June* the "*Triumph Alloy*" is one of two materials which "have been thoroughly tested and have been found entirely satisfactory."

Surely this "tidings" should make dentistry shout for joy!

But "the profession" would be pleased to know what this "entirely new formula" is, and how it was so "thoroughly tested" in so very short a time as to be found entirely satisfactory.

As to the *formula* I can give the analysis, but as to the "*testing*" for excellence I have not the slightest idea.

"Test" analysis of
"Triumph" alloy

Booth, Garrett & Blair.

Silver	65 x	Silver	66.74
Tin	28 or 30	Tin	27.44
Copper	5	Copper	4.27
Zinc	2	Zinc	1.42

Is not this both a funny and a sad "record" for progressive, *scientific* dental progress?

But still they come! and the heels of Father Time are fairly trodden upon by the announcement of a "TWENTIETH CENTURY ALLOY."

The announcement that "This is a Perfect Alloy in every Respect would naturally excite interest and investigation" were it not that this is, and always has been, the stereotyped assertion of every maker of "perfections" in amalgam alloys, but this one, coming to us with the statement from Theodore Menges, D.D.S., Secretary of the Northwestern University Dental School that its maker "will find the dental world will

greet your alloy with much satisfaction and a very royal welcome for it certainly fills the bill in every particular and cannot otherwise than prove highly satisfactory " seems entitled to distinguished consideration.

"Test" analysis of 20th Century Alloy		Booth, Garrett & Blair.	
Silver	65 x	Silver	66.81
Tin	28 or so	Tin	27.32
Copper	5	Copper	4.39
Zinc	2	Zinc	1.51

It seems to me that there is no comment to make upon such an "OUTCOME," except that is it a most discreditable and disgraceful fact that it is *possible* to so insult the American Dentistry of 1899. And yet, as I view it, it is *just what might have been expected*.

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